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The *Mathematics Grade and Course Level Expectations* draft document is an **updated** version to the March, 2004 K-12 Mathematics Grade Level Expectations.

The original K- 12 document was organized by grade levels, whereas the attached draft document is organized by Grade Level Expectations (GLEs) in grades K – 8 and by Course Level Expectations (CLEs) for high school.

The GLEs will provide the framework for instruction and assessment in grades K-8, while the CLEs will provide the framework for instruction and assessment for high school mathematics courses.

Several K-16 mathematics educators have provided input on the updates, but we would like your input as well. The draft will be available for electronic feedback until **August 31, 2007**. Please send all your comments, suggestions, and questions to the web reply following the directions below.

To provide feedback on a specific Mathematics Grade Level or Course Level Expectation:

- Provide **all** of the information listed below
- Be sure to include the specific Grade or Course Level Expectation on which you are providing feedback
- **Submit to the curriculum web reply:** webreplyimprcurr@dese.mo.gov

First Name:

Last Name:

Middle Initial:

Phone Number:

Email Address:

Position:

Grade or Course Level Expectation Evaluated:

Comments/Suggestions:

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Mathematics Grade and Course Level Expectations: *A Framework for Instruction and Assessment*

The *Mathematics Grade and Course Level Expectations* outline related ideas, concepts, skills and procedures that form the foundation for understanding and learning mathematics. It includes updates to the March, 2004 K-12 *Mathematics Grade Level Expectations*. In addition, it provides a framework to bring focus to teaching, learning, and assessing mathematics. The Grade Level Expectations (GLEs) in grades K-8 specify mathematical content that students need to understand deeply and thoroughly for future mathematics learning. The Course Level Expectations (CLEs) for Algebra I, Geometry, and Algebra II outline rigorous mathematics expectations for students enrolled in **traditional** or **integrated** courses that will prepare them for success in college, the workplace, and effective participation in civic life.

Since the Outstanding Schools Act of 1993, several documents have been developed prior to the 2004 K-12 *Grade Level Expectations* to aid Missouri school districts in creating curriculum that will enable all students to achieve their maximum potential. Those include:

- The *Show-Me Standards* which identify broad content knowledge and process skills for all students to be successful as they continue their education, enter the workforce, and assume civic responsibilities
- The *Framework for Curriculum Development* which provides districts with a “frame” for building curricula using the *Show-Me Standards* as a foundation
- The *Assessment Annotations for the Curriculum Frameworks* which identify content and processes that should be assessed at the local and state level in grades 4, 8, and 10 mathematics

Essential content, aligned to state and national documents that support inquiry-based instruction, included in the Grade and Course Level Expectations should be addressed in contexts that promote problem solving, reasoning, communication, making connections, and designing and analyzing representations. Each Grade and Course Level Expectation is aligned to the Show-Me Content and Process Standards (1996). A Depth-of-Knowledge level has been assigned to each grade or course level expectation. The Depth of Knowledge identifies the highest level at which the expectation will be assessed, based upon the demand of the GLE. Depth-of-Knowledge levels include: Level 1-recall; Level 2-skill/concept; Level 3-strategic thinking; and Level 4-extended thinking.

The Grade and Course Level Expectations format with examples below includes:

- black font – 2004 K-12 Grade Level Expectations document to which no updates have been made
- red font – updated 2004 K-12 Grade Level Expectations
- yellow highlights -- focus expectations for state assessments for grades 3-8 MAP assessments and End-of-Course Exams

***It is essential to include all expectations in your course or grade level curriculum, not just those highlighted, as they are important components in the understanding and learning of mathematics.**

Original GLE assessed at local level Measurement Big Idea 2 Concept E Grade 6

2. Apply appropriate techniques, tools and formulas to determine measurements	
E	Grade 6
Use relationships with angles and measurement	convert from one unit to another within a system of measurement (mass and weight)
DOK	1
ST	MA 2 1.6

Updated GLE assessed at the local level Measurement Big Idea 2 Concept B Grade 7

2. Apply appropriate techniques, tools and formulas to determine measurements	
B	Grade 7
Use angle measurement	use tools to measure angles to the nearest degree and classify the angle as acute, obtuse, right, straight or reflex
DOK	1
ST	MA 2 3.2

Original GLE assessed in MAP Assessments Measurement Big Idea 1 Concept D Grade 4

1. Understand measurable attributes of objects and the units, systems and processes of measurement	
D	Grade 4
Quantify competency	determine change from \$10.00 and add and subtract money values to \$10.00
DOK	2
ST	MA 1 1.10

Updated CLE assessed in MAP End-Of-Course Exam Measurement Big Idea 2 Concept C Geometry

2. Apply appropriate techniques, tools and formulas to determine measurements	
C	Geometry
Apply geometric measurements	determine surface area and volume of geometric figures including cones, spheres and cylinders
DOK	2
ST	MA 2 1.10

Sources: *College Board Standards for College Success: Mathematics and Statistics* (College Board, 2006). *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics* (National Council of Teachers of Mathematics, 2007); *Indicators of College Readiness within Missouri’s Two-Year Colleges* (Missouri Development Education Consortium); *Depth-of-Knowledge Levels* (Norman Webb); *Mathematics Engineering Technology & Science (METS) Alliance Report* (2006); *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics, 2000); *Show-Me Standards* (Missouri Department of Elementary and Secondary Education).

DRAFT----Number and Operations----DRAFT

1. Understand numbers, ways of representing numbers, relationships among numbers and number systems													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A	rote counts to 100	read, write, and compare whole numbers less than 100	read, write, and compare whole numbers less than 1000	read, write and compare whole numbers up to 10,000	read, write and compare whole numbers less than 100,000	read, write and compare whole numbers less than 1,000,000, <u>unit fractions</u> and decimals to hundredths (including location on the number line)	apply and understand whole numbers to millions, <u>unit fractions</u> and decimals to the thousandths (including location on the number line)	compare and order all <u>positive rational numbers</u> and finding their approximate location on a number line	compare and order all rational numbers including percents, and find their approximate location on a number line	compare and order rational and irrational numbers, including finding their approximate locations on a number line	compare and order rational and irrational numbers, including finding their approximate locations on a number line	compare and order rational and irrational numbers, including finding their approximate locations on a number line	
Read, write and compare numbers													
DOK	1	1	1	1	1	1	1	1	1	1	1	1	
ST	MA 5 1.10	MA 5 1.10	MA 5 1.10	MA 5 1.10	MA 5 1.10	MA 5 1.10	MA 5 1.10	MA 5 1.10	MA 5 1.10	MA 5 1.10	MA 5 1.10	MA 5 1.10	
B	recognize $\frac{1}{2}$ of a shape	recognize $\frac{1}{2}$ and $\frac{1}{4}$ of a shape	recognize unit fractions of a shape	represents commonly used fractions: halves, thirds and fourths	use models, benchmarks (0, $\frac{1}{2}$ and 1) and equivalent forms to judge the size of fractions	recognize and generate equivalent forms of <u>commonly used</u> fractions and decimals	recognize and generate equivalent forms of fractions, decimals and <u>benchmark</u> percents	recognize and generate equivalent forms of fractions, decimals and percents	use fractions, decimals and percents to solve problems	use real numbers and various models, drawing, etc. to solve problems	use real numbers and various models, drawing, etc. to solve problems	use real numbers and various models, drawing, etc. to solve problems	
Represent and use rational numbers													
DOK	1	1	1	1	2	2	2	2	2	2	2	2	
ST	MA 5 1.10	MA 5	MA 5 1.10	MA 5 1.10	MA 5 1.10	MA 5 1.10	MA 5 1.10	MA 5 1.10	MA 5 3.3	MA 5 3.3	MA 5 3.3	MA 5 3.3	
C	use <u>concrete objects</u> to <u>compose and decompose</u> values up to 10	<u>compose or decompose</u> whole numbers up to 20 using multiple strategies such as known facts, doubles and close to <u>doubles</u> , tens, and one place value	<u>compose or decompose</u> numbers by using a variety of strategies, such as using known facts, tens place value or <u>landmark numbers</u> to solve problems	recognize equivalent representations for the same number and generate them by <u>decomposing and composing numbers</u>	recognize equivalent representations for the same number and generate them by <u>decomposing and composing numbers</u>	recognize equivalent representations for the same number and generate them by <u>decomposing and composing numbers</u> , including expanded notation	recognize equivalent representations for the same number and generate them by <u>decomposing and composing numbers</u>	recognize equivalent representations for the same number and generate them by <u>decomposing and composing numbers</u> , including exponential notation	recognize equivalent representations for the same number and generate them by <u>decomposing and composing numbers</u> , including scientific notation	use a variety of representations to demonstrate an understanding of very large and very small numbers		use a variety of representations to demonstrate an understanding of very large and very small numbers	
Compose and decompose numbers													
DOK	2	2	2	2	2	2	2	2	2	2		2	
ST	MA 1 1.6	MA 1 1.6	MA 1 1.6	MA 1 1.6	MA 1 1.6	MA 5 1.6	MA 5 1.6	MA 5 1.6	MA 5 1.6	MA 5 1.6		MA 5 1.6	

DRAFT----Number and Operations----DRAFT

1. Understand numbers, ways of representing numbers, relationships among numbers and number systems -- continued													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
D		skip count by 2s, 5s and 10s	skip count by multiples of numbers less than 10	<u>classify numbers</u> by their characteristics, including odd and even	classify and describe numbers by their characteristics, including <u>odd, even, multiples and factors</u>	describe numbers according to their characteristics, including whole number <u>common factors and multiples, prime or composite, and square numbers</u>							
Classify and describe numeric relationships													
DOK		2	2	2	2	2							
ST		MA 5 1.6	MA 5 1.6	MA 5 1.6	MA 5 1.6	MA 5 1.10							

DRAFT----Number and Operations----DRAFT

2. Understand meanings of operations and how they relate to one another													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A		represent/ model a given situation involving addition and subtraction of whole numbers using pictures, objects, or symbols	Represent/ model a given situation involving multi- digit whole number addition or subtraction	Represent/ model a given situation involving multiplication and related division using various models including sets, arrays, areas, repeated subtraction, sharing and <u>partitioning</u>	represent and recognize multiplication and related division using various models, including equal intervals on the number line, equal size groups, distributive property, etc.	represent and recognize division using various models, including <u>quotative</u> and <u>partitive</u>							
Represent operations													
DOK ST													
		2 MA 1 1.10	2 MA 1 1.10	2 MA 1 1.6	2 MA 1 1.6	2 MA 1 1.10							
B		describe the effects of adding and subtracting whole numbers as well as the relationship between the two operations		describe the effects of multiplying and dividing whole and whole numbers as well as the relationship between the two operations		describe the effects of addition and subtraction on fractions and decimals	describe the effects of multiplication and division on fractions and decimals	describe the effects of all operations on <u>rational numbers</u> including integers		Describe the effects of operations, such as multiplication, division, and computing powers and roots on the magnitude of quantities			
Describe effects of operations													
DOK ST													
		2 MA 1 1.10		2 MA 1 1.10		2 MA 1 1.10	2 MA 1 1.10	2 MA 1 1.10		2 MA 1 1.10			
C							apply <u>properties of operations</u> (including order of operations) to positive rational numbers	apply <u>properties of operations</u> (including order of operations) to positive rational numbers and integers	apply <u>properties of operations</u> to all rational numbers including order of operations and inverse operations				
Apply properties of operations													
DOK ST													
							2 MA 1 1.10	1 MA 1 1.10	1 MA 1 1.10				

DRAFT----Number and Operations----DRAFT

2. Understand meanings of operations and how they relate to one another -- continued													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
D							identify and generate the relationship between square numbers and whole number roots and cubes and whole number cube roots	approximate the value of square roots to the nearest whole number		apply operations to real numbers, using mental computation or paper-and-pencil calculations for simple cases and technology for more complicated cases	apply operations to real numbers, using mental computation or paper-and-pencil calculations for simple cases and technology for more complicated cases	apply operations to matrices and complex numbers, using mental computation or paper-and-pencil calculations for simple cases and technology for more complicated cases	
Apply operations on real and complex numbers													
DOK							2	2		2	2	2	
ST							M 5 1.6	MA 5 3.2		MA 1 1.10	MA 1 1.10	MA 1 1.10	

DRAFT----Number and Operations----DRAFT

3. Compute fluently and make reasonable estimates													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A		describe or represent the mental strategy used to compute addition and subtraction problems	describe or notate the mental strategy used to compute addition or subtraction of whole numbers, including multi-digit numbers	represent a mental strategy used to compute a given multiplication problem up to 9 x 9	represent a mental strategy used to compute a given multiplication problem (up to 2-digit by 2-digit multiple of)	describe a mental strategy used to compute a given division problem, where the quotient is a multiple of 10 and the divisor is a 1-digit number (e.g., 350 /7)							
DOK		2	2	2	2	2							
ST		MA 1 3.2	MA 1 3.2	MA 1 3.2	MA 1 3.2, 3.3	MA 1 3.2							
B	connect number words (orally) and quantities they represent	Use strategies to develop fluency with basic number relationships of addition and subtraction for sums up to 20	demonstrate fluency including quick recall with basic number relationships of addition and subtraction for sums up to 20	use strategies develop fluency with basic number relationships (9 X 9) of multiplication and division	demonstrate fluency with basic number relationships (12 X 12) of multiplication and related division facts	demonstrate fluency with efficient procedures for adding and subtracting decimals and fractions (with unlike denominators) and division of whole numbers							
DOK	1	1	1	1	1	1							
ST	MA 1 1.10	MA.1 1.6	MA.1 1.6	MA.1 1.6	MA.1 1.6	MA 1 3.3							
C		apply and describe the strategy used to compute 2-digit addition or subtraction problems without regrouping	apply and describe the strategy used to compute 3-digit addition or subtraction problems with regrouping	apply and describe the strategy used to compute up to a given multiplication of 1-digit by 2-digit numbers	apply and describe the strategy used to compute a given multiplication of 2-digit by 2-digit numbers and related division facts	apply and describe the strategy used to compute a given division problem up to a 3- digit by 2- digit and addition and subtraction of fractions and decimals	multiply and divide positive rational numbers	apply all operations on rational numbers including integers					
DOK		2	2	2	2	2	2	2					
ST		MA 1 3.2	MA 1 3.2	MA 1 3.2	MA 1 3.2	MA 1 3.2	MA 1 3.1	MA 1 3.1					

DRAFT----Number and Operations----DRAFT

3. Compute fluently and make reasonable estimates -- continued												
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II
D			estimate sums and differences of whole numbers	estimate and justify sums and differences of whole numbers	estimate and justify products of whole numbers and decimal and fractions	estimate and justify quotients of whole numbers and sums and differences of decimals and fractions	estimate and justify the results of multiplication and division of positive rational numbers	estimate and justify the results of all operations on rational numbers		judge the reasonableness of numerical computations and their results	judge the reasonableness of numerical computations and their results	judge the reasonableness of numerical computations and their results, including complex numbers
Estimate and justify solutions												
DOK			3	3	3	3	2	2		2	2	2
ST			MA 1 3.2	MA 1 3.2	MA 1 3.2	MA 1 3.2	MA 1 3.2	MA 1 3.2		MA 1 3.2	MA 1 3.2	MA 1 3.2
F							solve problems using ratios and rates	solve problems involving proportions, such as scaling and finding equivalent ratios		solve problems involving proportions	solve problems involving proportions	solve problems involving proportions
Use proportional reasoning												
DOK							2	2		2	2	2
ST							MA 1 3.2	MA 1 3.2		MA 1 3.2	MA 1 3.3	MA 1 3.2

Algebraic Relationships

2/01/05

1. Understand patterns, relations and functions													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A	recognize or repeat sequences of sounds or shapes	extend patterns of sound, shape, motion or a simple numeric pattern	describe and extend simple numeric patterns and change from one representation to another	extend geometric (shapes) and numeric patterns to find the next term	describe geometric and numeric patterns	make and describe <u>generalizations</u> about geometric and numeric patterns							
DOK	2	2	2	2	2	2							
ST	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6							
B	create and continue patterns	describe how simple <u>repeating patterns</u> are generated	describe how simple <u>growing patterns</u> are generated	represent patterns using words, tables or graphs	analyze patterns using words, tables and graphs	represent and analyze patterns using words, tables and graphs	represent and describe patterns with tables, graphs, pictures, <u>symbolic rules</u> or words	analyze <u>patterns represented graphically or numerically with words or symbolic rules</u>	generalize <u>patterns represented graphically or numerically with words or symbolic rules, using explicit notation</u>	generalize patterns using <u>explicitly</u> or <u>recursively</u> defined functions	generalize patterns using <u>explicitly</u> or <u>recursively</u> defined functions	generalize patterns using <u>explicitly</u> or <u>recursively</u> defined functions	
DOK	2	2	2	2	2	2	2	2	2	2	2	2	
ST	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	
C							compare various forms of <u>representations</u> to identify a pattern	compare and contrast various forms of <u>representations</u> of patterns	compare and contrast various forms of <u>representations</u> of patterns	compare and contrast various forms of <u>representations</u> of patterns	compare and contrast various forms of <u>representations</u> of patterns	compare and contrast various forms of <u>representations</u> of patterns	
DOK							2	2	2	2	2	2	
ST							MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	

Algebraic Relationships

2/01/05

1. Understand patterns, relations and functions -- continued													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
D							identify <u>functions</u> as <u>linear</u> or <u>nonlinear</u> from tables or graphs	identify <u>functions</u> as <u>linear</u> or <u>nonlinear</u> from tables, graphs or equations	identify <u>functions</u> as <u>linear</u> or <u>nonlinear</u> from tables or graphs	understand and compare the properties of <u>linear</u> and <u>nonlinear functions</u>	apply appropriate <u>properties of exponents</u> to simplify expressions and solve equations	compare properties of linear, exponential, logarithmic and rational functions	
Identify and compare functions													
DOK							2	1	2	2	2	2	
ST							MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	
F										describe the effects of <u>parameter changes</u> on <u>linear</u> , <u>exponential</u> and <u>quadratic</u> functions (include intercepts)		describe the effects of <u>parameter changes</u> on functions	
Describe the effects of parameter changes													
DOK										2		2	
ST										MA 4 1.6, 3.8		MA 4 1.6, 3.8	

Algebraic Relationships

2/01/05

2. Represent and analyze mathematical situations and structures using algebraic symbols													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A		using addition or subtraction, represent a mathematical situation as an <u>expression</u> or number sentence	using addition or subtraction, represent a mathematical situation as an <u>expression</u> or number sentence	using all operations, represent a mathematical situation as an <u>expression</u> or number sentence	using all operations, represent a mathematical situation as an <u>expression</u> or number sentence	using all operations, represent a mathematical situation as an <u>expression</u> or number sentence using a letter or symbol	use <u>symbolic algebra</u> to represent unknown quantities in expressions and solve one-step equations	use <u>symbolic algebra</u> to represent unknown quantities in expressions and solve linear equations with one variable	use <u>symbolic algebra</u> to represent and solve problems that involve linear relationships, including systems of equations	use <u>symbolic algebra</u> to represent and solve problems that involve linear and quadratic relationships		use <u>symbolic algebra</u> to represent and solve problems that involve exponential, quadratic and logarithmic relationships	
DOK		2	2	2	2	2	2	2	2	2		2	
ST		MA 4 1.10	MA 4 1.10	MA 4 1.10	MA 4 1.10	MA 4 1.10	MA 4 3.3	MA 4 3.3	MA 4 3.3	MA 4 3.3		MA 4 3.3	
B		apply the commutative and associative properties of addition to whole numbers	solve problems with whole numbers using the commutative and associative properties of addition	use the <u>commutative, distributive and associative</u> properties of addition and multiplication for basic facts	use the <u>commutative, distributive and associative</u> properties of addition and multiplication for multidigit numbers	use the <u>commutative, distributive and associative</u> properties for fractions and decimals	use the <u>commutative, distributive and associative</u> properties to generate equivalent forms for simple algebraic expressions	use properties to generate equivalent forms for simple algebraic expressions that include positive rationals and integers	use properties to generate equivalent forms for simple algebraic expressions that include all rationals	describe and use algebraic manipulations, including factoring and rules of integer exponents and apply <u>properties of exponents</u> (including order of operations) to simplify expressions		describe and use algebraic manipulations, <u>inverse of composition</u> of functions	
DOK		2	2	2	2	2	2	2	2	2		2	
ST		MA 4 1.10	MA 4 3.2	MA 4 3.2	MA 4 3.2	MA 4 3.2	MA 4 3.2	MA 4 3.2	MA 4 3.2	MA 4 3.2		MA 4 3.2	

Algebraic Relationships

2/01/05

2. Represent and analyze mathematical situations and structures using algebraic symbols -- continued													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
C										use and solve equivalent forms of equations and inequalities (linear, piece-wise and quadratic)		use and solve equivalent forms of equations and inequalities	
Utilize equivalent forms													
DOK										2		2	
ST										MA 4 3.2		MA 4 3.2	
D										use and solve systems of linear equations or inequalities with 2 variables		use and solve systems of linear and quadratic equations or inequalities with 2 variables	
Utilize systems													
										2		2	
ST										MA 4 1.6		MA 4 1.6	

Algebraic Relationships

2/01/05

3. Use mathematical models to represent and understand quantitative relationships													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A	model situations that involve whole numbers, using pictures, objects or symbols	model situations that involve the addition of whole numbers, using pictures, objects or symbols	model situations that involve addition and subtraction of whole numbers, using pictures, objects or symbols	model problem situations, including multiplication with objects or drawings	model problem situations, using representations such as graphs, tables or number sentences	model problem situations and draw conclusions, using representations such as graphs, tables or number sentence	model and solve problems, using multiple representations such as tables, expressions and one-step equations	model and solve problems, using multiple representations such as graphs, tables, expressions, and linear equations	model and solve problems, using multiple representations such as graphs, tables, and linear equations, including systems of equations	identify quantitative relationships and determine the type(s) of functions that might model the situation to solve the problem	identify quantitative relationships and determine the type(s) of functions that might model the situation to solve the problem	identify quantitative relationships and determine the type(s) of functions that might model the situation to solve the problem	
DOK	2	2	2	2	2	3	2	2	2	2	2	2	
ST	MA 1 1.6, 3.6	MA 1 1.6,3.6	MA 1 1.6,3.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 3.6	MA 4 1.6,3.6	MA 4 3.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	

4. Analyze change in various contexts													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A			describe <u>qualitative</u> change, such as students growing taller	describe <u>quantitative</u> change, such as students growing two inches in a year	describe mathematical relationships in terms of constant rates of change	identify, model and describe situations with constant or varying rates of change	construct and analyze tables to compare situations with constant or varying rates of change	compare situations with constant or varying rates of change	analyze the nature of changes (including slope and intercepts) in quantities in linear relationships	analyze linear and quadratic functions by investigating rates of change, intercepts and zeros	analyze linear functions by investigating rates of change and intercepts	analyze exponential and logarithmic functions by investigating rates of change, intercepts and asymptotes	
DOK			2	2	2	3	3	2	2	2	2	2	
ST			MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	MA 4 1.6	

Geometric and Spatial Relationships

3/02/04

1. Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A	identify and describe 2- and 3-dimensional shapes using physical models (circle, rhombus, rectangle, triangle, sphere, rectangular prism, cylinder, pyramid) that represent shapes in their environment (stop sign, number cube, and ball)	identify, name and describe 2- and 3-dimensional shapes using physical models (circle, triangle, trapezoid, rectangle, rhombus, sphere, rectangular prism, cylinder, pyramid)	describe <u>attributes</u> and <u>parts</u> of 2- and 3-dimensional shapes (circle, triangle, trapezoid, rectangle, rhombus, sphere, rectangular prism, cylinder, pyramid)	compare and analyze 2-dimensional shapes by describing their <u>attributes</u> (circle, rectangle, rhombus, trapezoid, triangle)	name and identify <u>properties of 1-, 2- and 3-dimensional shapes</u> describe the <u>attributes of 2- and 3-dimensional shapes</u> using appropriate geometric vocabulary (rectangular prism, cylinder, pyramid, sphere, cone, parallelism, perpendicularity)	analyze and classify 2- and 3-dimensional shapes by describing the <u>attributes</u>		identify the 2-diimensional cross-section of a 3-dimensional shape	describe, classify and generalize relationships between and among types of a) 2-dimensional objects and b) 3- dimensional objects using their defining <u>properties</u> including Pythagorean Theorem		use inductive and deductive reasoning to establish the validity of geometric <u>conjectures</u> , prove theorems and critique arguments made by others	use trigonometric relationships with right triangles to determine lengths and angle measures	
Describe and use geometric relationships													
DOK	2	2	2	2	2	2		2	3		3	3	
ST	MA 2 1.10	MA 2 1.10	MA 2 1.10	MA 2 1.10	MA 2 1.10	MA 2 1.10		MA 2 1.10	MA 2 1.6		MA 2 3.5	MA 2 3.2	
B								describe relationships between <u>corresponding sides</u> , <u>corresponding angles</u> and corresponding perimeters of <u>similar polygons</u>		apply geometric properties such as similarity and angle relationship to solve multi-step problems in 2 dimensions			
Apply geometric relationships													
DOK								2		2			
ST								MA 2 1.6		MA 2 3.6			

Geometric and Spatial Relationships

3/02/04

1. Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships – continued													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
C		use models to compose and decompose 2-dimensional shapes		predict the results of putting together or taking apart 2- and 3-dimensional shapes	describe the results of subdividing, combining and <u>transforming shapes</u>	predict and justify the results of subdividing, combining and <u>transforming shapes</u>							
Compose and decompose shapes													
DOK		2		3	2	2							
ST		MA 2 1.6		MA 2 1.6	MA 2 1.6	MA 2 1.6							

2. Specify locations and describe spatial relationships using coordinate geometry and other representational systems													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A	describe, name and interpret relative positions in space (above, below, front, behind)	describe, name and interpret relative positions in space (left, right)	find and name locations with simple relationships on a map (coordinate system)	describe location using common language and geometric vocabulary (forward, back, left, right, north, south, east, west)	describe movement using common language and geometric vocabulary (forward, back, left, right, north, south, east, west)	use <u>coordinate systems</u> to specify locations, describe paths and find the distance between points along horizontal and vertical lines		use coordinate geometry to construct and identify geometric shapes in the <u>coordinate plane</u> using their properties	use coordinate geometry to analyze <u>properties of right triangles</u> and quadrilaterals (including the use of the Pythagorean Theorem)		make conjectures and solve problems involving 2-dimensional objects represented with Cartesian coordinates		
Use coordinate systems													
DOK	2	2	2	2	2	2		2	2		2		
ST	MA 2 1.10	MA 2 1.10	MA 2 3.1	MA 2 1.10	MA 2 1.10, 3.3	MA 2 1.10		MA 2 1.8, 3.2	MA 2 3.2		MA 2 3.3		

Geometric and Spatial Relationships

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3. Apply transformations and use symmetry to analyze mathematical situations													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A	use manipulatives to recognize from different perspectives and orientations models of slides and turns	use manipulatives to model flips	use manipulatives to model slides and turns	determine if two objects are <u>congruent</u> through a slide, flip or turn	predict the results of <u>sliding/ translating/ flipping/ reflecting or turning/ rotating around the center point</u> of a polygon	predict, draw and describe the results of <u>sliding/ translating/ flipping/ reflecting and turning/ rotating around a center point</u> of a polygon			reposition shapes under <u>formal</u> transformations such as reflection, rotation and translation		use and apply constructions and the coordinate plane to represent translations, reflections, rotations and dilations of objects		
DOK	2	2	2	2	2	2			2		2		
ST	MA 2 1.6	MA 2 1.6	MA 2 1.6	MA 2 3.2	MA 2 3.6	MA 2 3.6			MA 2 3.6		MA 2 1.10		
B									describe the relationship between the scale factor and the perimeter of the image using a <u>dilation (contractions-magnifications)</u> (stretching/ shrinking)			translate, dilate and reflect <u>functions</u>	
DOK								2				2	
ST								MA 2 3.6				MA 4 3.1	
C		recognize shapes that have symmetry	create shapes that have symmetry	identify lines of symmetry in polygons	construct a figure with multiple lines of symmetry and identify the lines of symmetry	identify polygons and designs with <u>rotational symmetry</u>	construct polygons and designs with <u>rotational symmetry</u>	determine all lines of symmetry of a polygon	identify the number of rotational symmetries of regular polygons		identify types of symmetries of 2- and 3-dimensional figures		
DOK		1	2	1	2	2	2	1	1		2		
ST		MA 2 1.10	MA 2 1.10	MA 2 1.10	MA 2 1.10	MA 2 1.6	MA 2 1.6	MA 2 1.6	MA 2 1.6		MA 2 1.10		

Geometric and Spatial Relationships

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4. Use visualization, spatial reasoning and geometric modeling to solve problems													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A					given the picture of a <u>prism</u> , identify the shapes of the faces	given a <u>net of a prism</u> or cylinder, identify the 3-dimensional shape	use spatial visualization to identify <u>isometric representations</u> of <u>mat plans</u>	use spatial visualizations to identify various 2-dimensional views of <u>isometric drawings</u>	create <u>isometric drawings</u> from a given <u>mat plan</u>		draw and use vertex-edge graphs or networks to find optimal solutions and draw representations of 3-dimensional geometric objects from different perspectives		
Recognize and draw three-dimensional representations													
DOK					2	2	2	2	2		3		
ST					MA 2 3.3	MA 2 3.3	MA 2 3.3	MA 2 3.3	MA 2 3.3		MA 2 4.1		
B							draw or use visual models to represent and solve problems	draw or use visual models to represent and solve problem	draw or use visual models to represent and solve problems	draw or use visual models to represent and solve problems	draw or use visual models to represent and solve problems	draw or use visual models to represent and solve problems	
Draw and use visual models													
DOK							2	2	2	2	2	2	
ST							MA 2 3.3	MA 2 3.3	MA 2 3.3	MA 2 3.3	MA 2 3.3	MA 2 3.3	

Measurement

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1. Understand measurable attributes of objects and the units, systems and processes of measurement													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A	compare and order objects according to their size or weight	select the appropriate tool for the attribute being measured (size, temperature, time, weight)	select an appropriate unit and tool for the attribute being measured (size, temperature, time, weight) and to the nearest inch, centimeter, degree, hour and pound	Identify, justify and use the appropriate unit of measure (linear, time, weight)	identify and justify the unit of linear measure including perimeter and (customary metric)	identify and justify the unit of measure for area (customary and metric)	identify and justify the unit of measure for area and volume (customary and metric)	identify and justify the unit of measure for volume (customary and metric)					
DOK	2	2	2	2	2	2	2	2					
ST	MA 2 1.8	MA 2 3.1	MA 2 3.1	MA 2 3.1	MA 2 3.1	MA 2 3.1	MA 2 3.1	MA 2 3.1					
B					identify equivalent linear measures within a system of measurement	identify the equivalent weights and equivalent capacities within a system of measurement		identify the equivalent area and volume measures within a system of measurement (e.g., sq ft. to sq in, m³ to c m³)					
DOK					1	1		1					
ST					MA 2 1.6	MA 2 1.6		MA 2 1.6					
C	describe passage of time using terms such as today, yesterday, tomorrow	tell time to the nearest half hour	tell time to the nearest one fourth (quarter) hour	tell time to the nearest five minutes	tell time to the nearest minute		solve problems involving elapsed time (hours and minutes)	solve problems involving addition and subtraction of time (hours, minutes and seconds)					
DOK	2	1	1	1	1		1	1					
ST	MA 2 3.2	MA 2 3.2	MA 2 3.2	MA 2 3.2	MA 2 3.2		MA 5 3.2	MA 5 3.2					

1. Understand measurable attributes of objects and the units, systems and processes of measurement -- continued													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
D	identify and know the value of a penny, nickel, dime, and quarter	count money to a dollar, including half dollars	make change from a dollar	determine change from \$5.00 and add and subtract money values to \$5.00	determine change from \$10.00 and add and subtract money values to \$10.00								
Count and compute money													
DOK	2	2	2	2	2								
ST	MA 1 1.10	MA 1 1.10	MA 1 1.10	MA 1 1.10	MA 1 1.10								

2. Apply appropriate techniques, tools and formulas to determine measurements													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A	measure objects by comparison of lengths (shorter, same, longer)	use repetition of a single unit to measure something larger than the unit, (e.g. length of book with paper clips)	use standard units of measure (cm, inch) and the inverse relationships between the size and number of units	use a referent for measures to make comparisons and estimates	select and use benchmarks to estimate measurements (linear, capacity, weight)								
Use standard or non-standard measurement													
DOK	2	2	2	2	2								
ST	MA 2 1.6	MA 2 1.6	MA 2 1.6	MA 2 1.6	MA 2 1.6								
B					select and use benchmarks to estimate measurements of 0-, 45- (acute), 90- (right) greater than 90 (obtuse) degree angles			use tools to measure angles to the nearest degree and classify the angle as acute, obtuse, right, straight, or reflex	solve problems of angle measure, including those involving triangles and parallel lines cut by a transversal		solve problems of angle measure, including those involving triangles or other polygons and of parallel lines cut by a transversal		
Use angle measurement													
DOK								1	1		1		
ST					MA 2 3.2			MA 2 3.2	MA 2 3.2		MA 2 3.1		
C				determine the perimeter of polygons	determine and justify areas of polygons and non-polygonal regions imposed on a rectangular grid	determine volume by finding the total number of the same size units needed to fill a space without gaps or overlaps	solve problems involving the area or perimeter of polygons	solve problems involving circumference and/or area of a circle and surface area/volume of a rectangular or triangular prism, or cylinder			determine the surface area, and volume of geometric figures, including cones, spheres, and cylinders		
Apply geometric measurements													
DOK													
ST				MA 2 1.10	MA 2 1.10	MA 2 1.10	MA 2 1.10	MA 2 1.10			MA 2 1.10		

Measurement

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2. Apply appropriate techniques, tools and formulas to determine measurements -- continued													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
D									analyze <u>precision</u> and accuracy in measurement situations and determine number of significant digits	describe the effects of operations, such as multiplication, division and computing powers and roots on magnitudes of quantities and effects of computation on <u>precision</u> which include the judging of reasonable of numerical computations and their results		apply concepts of successive approximation	
Analyze precision													
DOK									2	2		2	
ST									MA 2 1.7	MA 2 1.7		MA 2 1.6	
F						convert from one unit to another within a system of linear measurement (customary and metric)	convert from one unit to another within a system of measurement (mass and weight)	convert from one unit to another within a system of measurement (capacity) and convert square or cubic units within the same system of measurement		use <u>unit analysis</u> to solve problems	use <u>unit analysis</u> to solve problems	use <u>unit analysis</u> to solve problems involving rates, such as speed, density or population density	
Use relationships within a measurement system													
DOK						1	1	1		2	2	2	
ST						MA 2 1.6	MA 2 1.6	MA 2 1.6		MA 4 1.10	MA 4 1.10	MA 4 1.10	

Data and Probability

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1. Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A		pose questions and gather data about themselves and their surroundings	pose questions and gather data about themselves and their surroundings	design investigations to address a given question	collect data using observations, surveys and experiments	evaluate data-collection methods	formulate questions, design studies and collect data about a characteristic			formulate questions and collect data about a characteristic which include <u>sample spaces</u> and <u>distributions</u>	formulate and collect data about a characteristic		
Formulate questions													
DOK		3	3	3	3	3	3			3	3		
ST		MA 3 1.2	MA 3 1.2	MA 3 1.2	MA 3 1.2	MA 3 1.2	MA 3 1.2			MA 3 1.2	MA 3 1.2		
B	sort items according to their <u>attributes</u>	sort and classify items according to their <u>attributes</u>	sort and classify items according to their <u>attributes</u> and organize data about the items										
Classify and organize data													
DOK	3	3	3										
ST	MA 2 1.8	MA 2 1.8	MA 3 1.8										
C	create graphs using physical objects	Represent <u>one-to-one</u> <u>correspondence</u> data using pictures and bar graphs	represent <u>one-to-many</u> <u>correspondence</u> data using pictures and bar graphs	read and interpret information from <u>line plots</u> and graphs (<u>bar</u> , <u>line</u> , <u>pictorial</u>)	create tables or graphs to represent <u>categorical</u> and <u>numerical</u> data (including <u>line plots</u>)	describe methods to collect, organize and represent <u>categorical</u> and <u>numerical</u> data	interpret circle graphs; create and interpret <u>stem-and-leaf plots</u>	select, create and use appropriate graphical representation of data, including circle graphs, <u>histograms</u>)	select, create and use appropriate graphical representation of data (including <u>scatter plots</u>) and <u>box plots (box and whiskers)</u>	select and use appropriate graphical representation of data and given <u>one-variable</u> <u>quantitative</u> data, display the distribution and describe its shape	select and use appropriate graphical representation of data and given <u>one-variable</u> <u>quantitative</u> data, display the distribution and describe its shape	select and use appropriate graphical representation of data and given <u>one-variable</u> <u>quantitative</u> data, describe its shape and calculate <u>summary statistics</u>	
Represent and interpret data													
DOK	2	2	2	2	2	2	2	2	2	2	2	2	
ST	MA 3 1.8	MA 3 1.8	MA 3 1.8	MA 3 1.10	MA 3 1.8	MA 3 1.2	MA 3 1.8	MA 3 1.8	MA 3 1.8	MA 3 1.8	MA 6 1.8	MA 3 1.8	

Data and Probability

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2. Select and use appropriate statistical methods to analyze data													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A				describe the <u>shape of data</u> and analyze it for patterns	describe important <u>features</u> of the data set	compare related data sets	find the <u>range</u> and <u>measures of center</u> , including <u>median</u> , <u>mode</u> and <u>mean</u>	find, use and interpret <u>measures of center and spread</u> , including ranges	find, use and interpret <u>measures of center</u> , <u>outliers</u> and spread, including range and <u>interquartile range</u>	apply statistical measures of center to solve problems		apply statistical measures of center to solve problems	
Describe and analyze data													
DOK				2	2	2	2	2	2	2		2	
ST				MA 3 1.6	MA 3 3.2	MA 3 1.5	MA 3 3.2	MA 3 3.2	MA 3 3.2	MA 3 3.2		MA 3 3.2	
B									compare different representations of the same data and evaluate how well each representation shows important aspects of the data				
Compare data representations													
DOK									3				
ST									MA 3 1.10				
C										given a scatterplot, determine an equation for a <u>line of best fit</u>		given a scatterplot, determine a type of function which models the data	
Represent data algebraically													
DOK										2		2	
ST										MA 3 1.6		MA 3 1.6	

Data and Probability

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3. Develop and evaluate inferences and predictions that are based on data													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A				discuss events related to students' experiences as likely or unlikely	given a set of data, propose and justify conclusions that are based on the data	given a set of data make and justify predictions	use observations about differences between 2 samples to make <u>conjectures</u> about the populations from which the samples were taken	use observations about differences between 2 samples to make <u>conjectures</u> about the populations from which the samples were taken	make <u>conjectures</u> about possible relationships between 2 characteristics of a sample on the basis of scatter plots of the data and approximate lines of fit	make <u>conjectures</u> about possible relationships between 2 characteristics of a sample on the basis of scatter plots of the data			
Develop and evaluate inferences													
DOK													
ST													
B													
Analyze basic statistical techniques													
DOK													
ST													

4. Understand and apply basic concepts of probability													
	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Algebra I	Geometry	Algebra II	
A						describe the degree of likelihood of events using such words as certain, equally likely and impossible	use a model (diagrams, list, sample space, or area model) to illustrate the possible outcomes of an event	use models to compute the probability of an event and make conjectures (base on theoretical probability) about the results of experiments				describe the concepts of <u>sample space</u> and <u>probability distribution</u>	
Apply basic concepts of probability													
DOK													
ST						2	2	2				2	
						MA 3 1.10	MA 3 1.10, 3.2	MA 3 3.3				MA 3 3.1	
B												use and describe the concepts of conditional probability and independent events and how to compute the probability of a <u>compound event</u>	
Use and describe compound events													
DOK													
ST												2	
												MA 3 3.1	